Intelligent Automation Incorporated

Coherent distributed radar for high-resolution through-wall imaging

Progress Report 19

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Prepared by
Eric van Doorn, Ph.D. (PI)
Satya Ponnaluri, Ph.D.

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Summary

In this period of performance, we are continuing to develop the hardware, and software for the final demonstration.

1.0 INTRODUCTION

In this report we discuss progress in radar design, software design, and simulations

1.1 Hardware build up

All hardware has been received, and we are now integrating two Synchronization transceivers.

1.2 Simulations

In this period we are studying ranging using blind beamforming. Blind beamforming is where the receiver moves to different positions during ranging to increase the aperture, but the relative displacement is unknown to the receiver. Here we assume constant spacing between measurements which is smaller than half the carrier wavelength. For instance, if the carrier frequency is 900MHz, and the speed is 1m/s, we assume 6 or more range measurements per second. We simulate two cases.

Case 1: spacing λ/2; direction 12 o'clock, Case 2: spacing λ/4; direction 11 o'clock
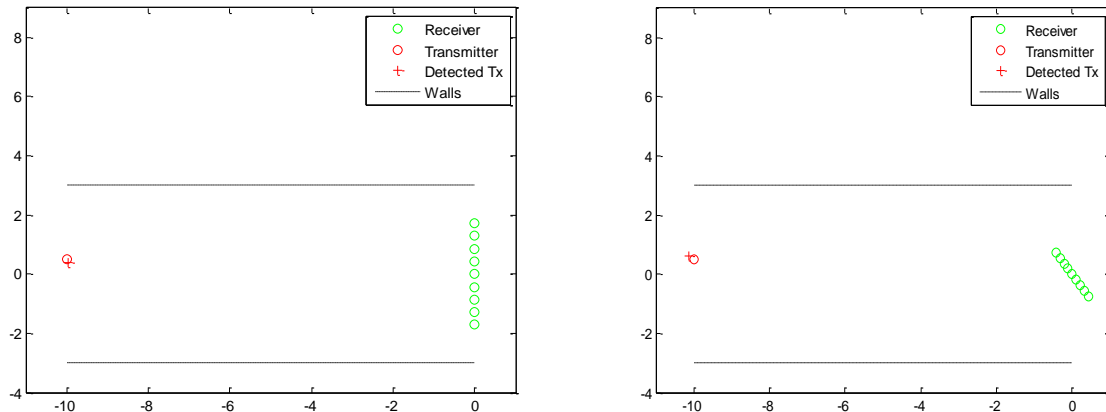

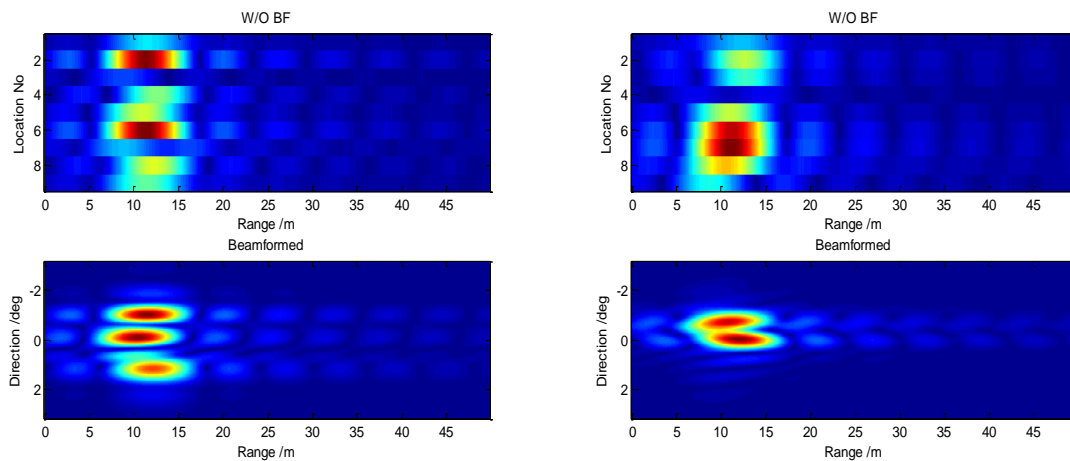**Figure 1. Simulated scenarios.**

Figure 2. raw signal original vs. Beamformed. Left: Case I. Right: Case 2.

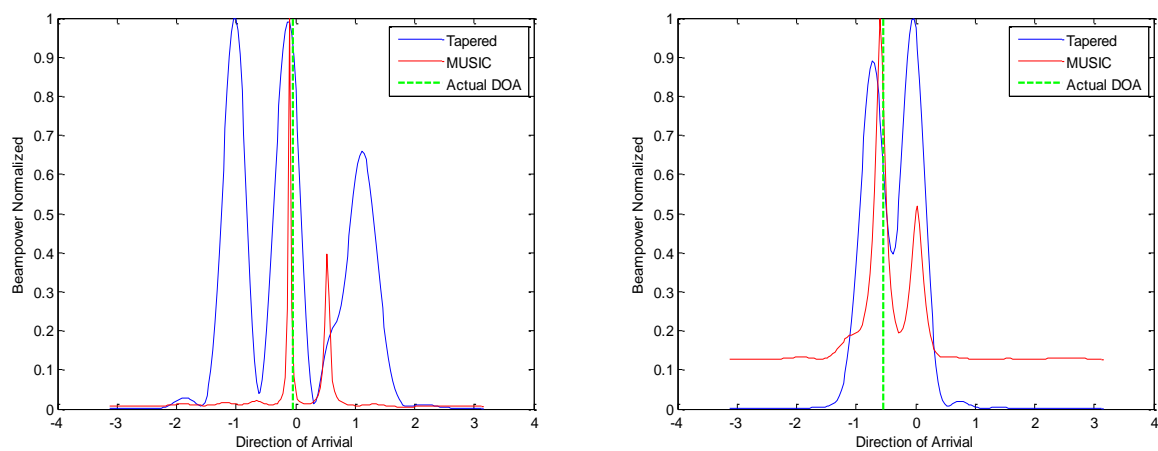We show the results for direction finding below.

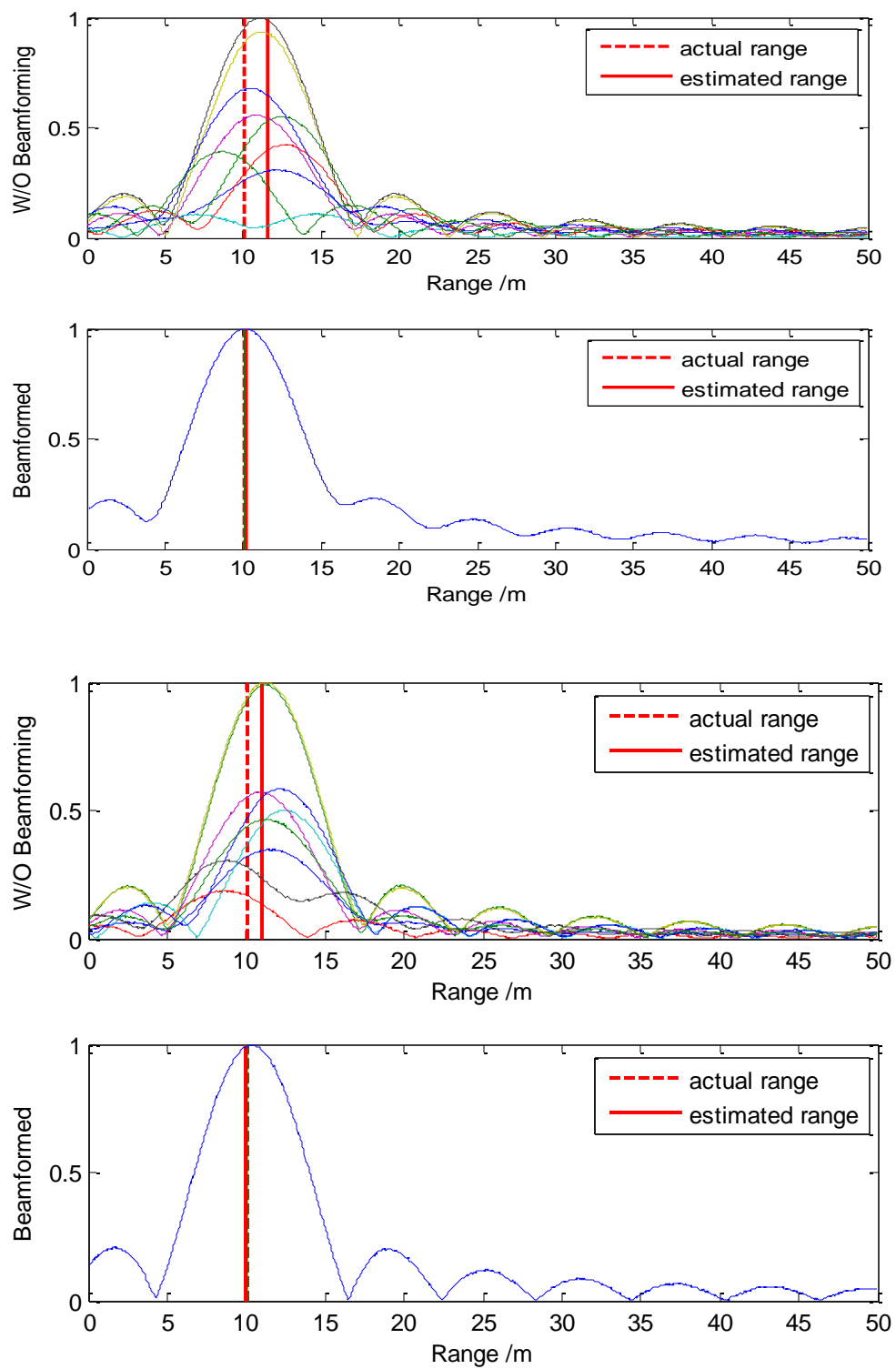
Figure 3. Direction Finding results.

Figure 4. Results for ranging error. Top: Case 1, bottom: case2.

We show the results for ranging with beamforming in the figure above. We conclude that improvement of ranging can be achieved in both cases. This means that ranging accuracy with our synchronization transceiver, under the assumptions of mild acceleration, could be significantly improved by using digital beamforming techniques.